AMENDMENT TO THE SPECIFICATION

Please amend the DISCLOSURE OF THE INVENTION part of the specification, from line 18 at Page 5 to line 27 at page 20, as follows:

"DISCLOSURE OF THE INVENTION

In order to achieve the above objects, according to ~~claim~~ embodiment 1, a starter of single-phase induction motor having main winding and auxiliary winding energized by alternating-current power source, comprising:

a casing,

a positive characteristic thermistor connected in series to the auxiliary winding,

an auxiliary positive characteristic thermistor connected parallel to the positive characteristic thermistor and the snap action bimetal,

a snap action bimetal connected in series to a series circuit of auxiliary winding and positive characteristic thermistor for sensing the heat from the auxiliary positive characteristic thermistor and turning off when reaching a set temperature, and

an enclosed compartment accommodated in the casing, for enclosing the snap action bimetal and auxiliary positive characteristic thermistor.

In order to achieve the above objects, according to ~~claim~~ embodiment 5, a starter of single-phase induction motor having main winding and auxiliary winding energized by alternating-current power source, comprising:

a casing,

a positive characteristic thermistor connected in series to the auxiliary winding,

an auxiliary positive characteristic thermistor connected parallel to the positive characteristic thermistor and the snap action bimetal,

a bimetal connected in series to a series circuit of auxiliary winding and positive characteristic thermistor for sensing the heat from the auxiliary positive characteristic thermistor and turning off when reaching a set temperature,

an enclosed compartment accommodated in the casing, for enclosing the bimetal and auxiliary positive characteristic thermistor, and

a magnet for applying magnetic force to the bimetal so as to force the contact point to the ON side.

According to ~~claim~~ embodiment 7, a starter of single-phase induction motor having main winding and auxiliary winding energized by alternating-current power source, comprising:

a casing,

a positive characteristic thermistor connected in series to the auxiliary winding,

an auxiliary positive characteristic thermistor connected parallel to the positive characteristic thermistor and the snap action bimetal,

a temperature sensing magnet for sensing the heat from the auxiliary positive characteristic thermistor and demagnetizing when reaching a set temperature,

a switch connected in series to a series circuit of auxiliary winding and positive characteristic thermistor, and turning on as being attracted by the magnetic force of the temperature sensing magnet, and turning off by demagnetization of the temperature sensing magnet, and

an enclosed compartment accommodated in the casing, for enclosing the switch.

According to ~~claim~~ embodiment 8, a starter of single-phase induction motor having main winding and auxiliary winding energized by alternating-current power source, comprising:

a positive characteristic thermistor connected in series to the auxiliary winding,

an auxiliary positive characteristic thermistor connected parallel to the positive characteristic thermistor and the snap action bimetal,

a temperature sensing magnet for sensing the heat from the auxiliary positive characteristic thermistor and demagnetizing when reaching a set temperature, and

a reed switch connected in series to a series circuit of auxiliary winding and positive characteristic thermistor, and turning on as being attracted by the magnetic force of the temperature sensing magnet, and turning off by demagnetization of the temperature sensing magnet.

In the starter for single-phase induction motor as set forth in ~~claim~~ embodiment 1 of the invention, when starting

up the single-phase induction motor, since the positive characteristic thermistor is low in resistance, a starting current flows through the auxiliary winding by way of a series circuit of positive characteristic thermistor and snap action bimetal, and the single-phase induction motor is started up. By flow of starting current, the positive characteristic thermistor generates heat by itself, and becomes high in resistance, and more current flows into the auxiliary positive characteristic thermistor side connected parallel to the positive characteristic thermistor. When the auxiliary positive characteristic thermistor reaches a set temperature, the snap action bimetal is cut off, and no current flows into the positive characteristic thermistor, and the single-phase induction motor starts up completely, and gets into stationary operation.

When the snap action bimetal is cut off, current flows only into the auxiliary positive characteristic thermistor side to generate heat, and by this heat generation, the snap action bimetal is kept in OFF state.

Therefore, during stationary operation of single-phase induction motor, no current flows into the positive characteristic thermistor and instead current flows into

the auxiliary positive characteristic thermistor side, but the current flowing in the auxiliary positive characteristic thermistor is very small only enough to generate heat in the auxiliary positive characteristic thermistor for holding the OFF state of the snap action bimetal, and power consumption by the auxiliary positive characteristic thermistor is extremely smaller than the power consumption by the conventional positive characteristic thermistor.

In particular, since the snap action bimetal and auxiliary positive characteristic thermistor are contained in a same enclosed compartment in the casing, heat hardly radiates outside, and the OFF state of the snap action bimetal can be maintained by a very small power consumption. Further, as the refrigerant of enclosed compressor, flammable gas (hydrocarbon compound such as butane) is used, and if the refrigerant leaks, it is contained within the enclosed compartment, ignition by spark in opening and closing action of snap action bimetal is prevented.

Further, during stationary operation of single-phase induction motor, the positive characteristic thermistor for starting in large thermal capacity is cooled, and temperature is ordinary. On the other hand, since the auxiliary positive characteristic thermistor is small in thermal capacity, it is quick to cool. Therefore, when attempted to start up again right after stopping the single-phase induction motor, the auxiliary positive characteristic thermistor is immediately cooled nearly to ordinary temperature, and it is ready to start up very quickly in several seconds to dozens of seconds, and it is possible to re-start quickly without repetition of operation and reset of overload relay as in the prior art.

Moreover, a small-sized auxiliary positive characteristic thermistor is used for heating the bimetal, it is effective for correcting changes in response to ambient temperature, without ~~effects~~ the disadvantages of voltage fluctuations.

According to ~~claim~~ embodiment 2, the starter of single-phase induction motor, wherein the snap action bimetal is composed of a movable contact plate for oscillating a movable contact point, a bimetal, and a plate

spring of semicircular section interposed between first support point of the movable contact plate and second support point of the bimetal,

the movable contact plate is forced so as to cause the plate spring to push the movable contact point to the fixed contact point side when the second support point is shifted to the leading end position side at low temperature of the bimetal, ~~than the line segment linking the support point of the movable contact plate and the first support point~~, and

the movable contact plate is forced so as to cause the plate spring to depart the movable contact point from the fixed contact point side when the second support point is shifted to the leading end position side at high temperature of the bimetal~~, than the line segment linking the support point of the movable contact plate and the first support point~~. Accordingly, the snap action bimetal can cut off the contact quickly. Therefore, the arc does not continue, rough contact or noise does not occur. Connection time after contact pressure ~~becoming~~ becomes zero ~~is short~~, and the contact is not opened or closed by vibration. Hence the connection reliability of contact is high, and durable ~~it is free from defect for a long period of time~~.

In ~~claim~~ embodiment 3, the starter of single-phase induction motor, wherein the snap action bimetal is a bimetal processed by drawing. In ~~claim~~ embodiment 4, the starter of single-phase induction motor, wherein the snap action bimetal is a bimetal processed by forming in a circular form in the center. Accordingly, the snap action bimetal can cut off the contact quickly. Therefore, the arc does not continue, rough contact or noise does not occur. Connection time after contact pressure ~~becoming~~ becomes zero ~~is short~~, and the contact is not opened or closed by vibration. Hence the connection reliability of contact is high, and durable ~~it is free from defect for a long period of time~~.

In ~~claim~~ embodiment 5, the bimetal having contact at free end side is forced to the contact ON side by the magnetic force of the magnet. When the bimetal is cut off, the magnetic force from the magnet is lowered inversely proportional to the square of the distance. The bimetal receives the strongest magnetic force in contact ON state, and after the contact leaves, the magnetic force decreases rapidly, so that the contact can be cut off quickly. Therefore, the arc does not continue, rough contact or noise does not occur. Connection time after contact

pressure ~~becoming~~ becomes zero ~~is short~~, and the contact is not opened or closed by vibration. Hence the connection reliability of contact is high, and durable ~~it is free from defect for a long period of time~~.

In ~~claim~~ embodiment 6, an auxiliary positive characteristic thermistor contacts with the base of the bimetal. Hence, heat from the auxiliary positive characteristic thermistor can be efficiently transmitted to the bimetal, and the OFF state of the bimetal can be maintained by the auxiliary positive characteristic thermistor of small power consumption.

In ~~claim~~ embodiment 7, for example, a switch having a contact at free end side of spring plate made of magnetic conductive member senses heat from the auxiliary positive characteristic thermistor, and when reaching the set temperature, it is forced by the magnetic force of the temperature sensing magnet which is demagnetized. That is, at less than the set temperature, the switch resists the elastic force of the spring plate, and is attracted by the magnetic force of temperature sensing magnet, and is turned on, and when exceeding the set temperature, the switch is turned off by the elastic force of spring plate by

demagnetization of the temperature sensing magnet. At this time of turning off, the magnetic force from the temperature sensing magnet drops inversely proportional to the square of the distance. The switch has the strongest magnetic force in contact ON state, and after the contact leaves, the magnetic force drops rapidly, so that the contact can be cut off quickly. Therefore, the arc does not continue, rough contact or noise does not occur. Connection time after contact pressure ~~becoming~~ becomes zero ~~is short~~, and the contact is not opened or closed by vibration. Hence the connection reliability of contact is high, and durable ~~it is free from defect for a long period of time~~.

In ~~claim~~ embodiment 8, a reed switch senses the heat from the auxiliary positive characteristic thermistor, it is turned on or off by the magnetic force of temperature sensing magnet which is demagnetized when reaching the set temperature. At lower than the set temperature, the reed switch is turned on by the magnetic force of temperature sensing magnet, and when exceeding the set temperature, the reed switch is turned off by demagnetization of the temperature sensing magnet. At this time of turning off, the magnetic force from the temperature sensing magnet drops inversely proportional to the square of the distance,

and the reed switch is cut off quickly. Therefore, the arc does not continue, rough contact or noise does not occur. Connection time after contact pressure becoming zero is short, and the contact is not opened or closed by vibration. Hence the connection reliability of contact is high, and it is free from defect for a long period of time.

In ~~claim~~ embodiment 9, the starter of single-phase induction motor, wherein a through-hole is pierced in a specified position of a conductor plate having a spring member for connecting electrically while holding the positive characteristic thermistor by elastic force, and a fuse is provided by narrowing the width in the outer circumference of the through-hole. Hence, in the event of abnormal heat generation of positive characteristic thermistor, thermal runaway, or elevation of resistance to cause nearly short-circuited state to increase current, the fuse melts down. Hence, burning starting winding or starting relay can be prevented.

In ~~claim~~ embodiment 10, slots are provided in the contacting corners bent at obtuse angle for contacting with positive characteristic thermistor in the spring section for holding the positive characteristic thermistor. As a

result, contact points with positive characteristic thermistor of contacting corners are divided and doubled in number, so that the contact reliability can be enhanced.

In ~~claim~~ embodiment 11, notches are provided in the contacting corners bent at obtuse angle for contacting with positive characteristic thermistor in the spring section for holding the positive characteristic thermistor. As a result, contact points with positive characteristic thermistor of contacting corners are divided and doubled in number, so that the contact reliability can be enhanced. Further, the resonance frequency of contacting corners is different between the inside and outside of the notch. Compressor vibration is transmitted to the starter, and the positive characteristic thermistor and spring member resonance, and if the positive characteristic thermistor electrode is hit by spring member, the electrode may damaged or separated, but in ~~claim~~ embodiment 11, since the resonance frequency is different between the inside and outside of contacting corners, they do not resonate at the same time, and the contacting corners will not hit the positive characteristic thermistor, and electrodes of positive characteristic thermistor will not be damaged.

In order to achieve the above objects, according to ~~claim~~ embodiment 12, a starter of single-phase induction motor having main winding and auxiliary winding, comprising a positive characteristic thermistor connected in series to the auxiliary winding, and a socket terminal for connecting electrically with a detachable connection pin,

wherein the socket terminal has a pair of plates extending sideways in the axial direction of connection pin bent to the inner side, has the leading end formed in an arc shape so as to conform to the columnar shape of the connection pin, and is provided with a connection pin holder having the leading ends spaced from each other, and

the connection pin holder is divided into two sections by the slit in the connection pin axial direction and vertical direction, into leading end side first position, and inner side second position.

In the starter of ~~claim~~ embodiment 12, since the connection pin holder of the socket terminal is divided into two sections, first portion at leading end side and second portion at inner side, and if galling force acts when inserting the connection pin, spreading is limited to the first portion at leading end side and spreading is not extended to the second portion at inner side. In the second

portion, hence, fatigue is prevented ~~does not occur~~, and favorable contact state with connection pin is maintained ~~can be held~~, and damage by heating of contact portion does not occur.

Further, when inserting into the connection pin, the first portion at the leading end side is spread and inserted, and when the connection pin leading end reaches the second portion, the second portion begins to spread. That is, the force required for inserting is strongest at the beginning and then remains nearly unchanged in order to push open the portion narrower than the connection pin, but in the invention, it is enough to push open only the first portion at the leading end side being divided, at the initial time of inserting the connection pin, and as compared with the conventional product required to push open the entire connection pin holder, the inserting process is easier. Since the size is same as in the conventional product, the space efficiency is high, and it is easy to apply in the existing starter.

If there is inclination between the connection pin and socket terminal, since the first portion at the leading end and the second portion at the inner side independently

contact with the connection pin, if the connection pin and socket terminal contact with each other point to point, the contact point is doubled in number, and the electric connection of connection pin and socket terminal can be assured.

In ~~claim~~ embodiment 13, since the recess of accommodating the leading end of the connection pin penetrating through the connection pin holder is provided in the casing, the chamfered portion of the leading end of the connection pin penetrates through the connection pin holder and is positioned in the recess. That is, the since the chamfered portion is not held by the connection pin holder, the gripping force of the connection pin by the connection pin holder can be enhanced, and it is also effective to lower the contact resistance.

In ~~claim~~ embodiment 14, since the first portion at the leading end side of the connection pin holder is formed wider so as to hold the connection pin more moderately than the inner side second portion, and only a small effort is needed when inserting to insert the connection pin. On the other hand, the inner side second portion is formed narrowly, and a favorable contact state with the connection

pin can be held at the second portion, so that damage by heating in the contact portion does not occur.

In ~~claim~~ embodiment 15, since the length of the connection pin holder in the connection pin axial direction of the first portion at leading end is formed longer than the inner side second portion, the galling force when inserting the connection pin is held in the first portion, and spreading of galling to the second portion is arrested. As a result, favorable contact state with the connection pin can be maintained in the second portion, and damage due o heating of connection portion does not occur.

In ~~claim~~ embodiment 16, since the length of the connection pin holder in the connection pin axial direction of the second portion at the inner side is formed longer than the leading end first portion at the inner side, by firmly holding the connection pin at the second portion, fatigue is prevented ~~does not occur~~, and favorable contact state with the connection pin is maintained, and damage by heating of contact portion does not occur.

In ~~claim~~ embodiment 17, since V-notch is provided at the leading end of the second portion at the inner side of

the connection pin holder, when inserting into the connection pin, if the connection pin leading end reaches the second potion after inserting into the first portion of the leading end side, it can be easily inserted into the second portion side, and the inserting work is easy.

In order to achieve the above objects, according to ~~claim~~ embodiment 19, a starter of single-phase induction motor having main winding and auxiliary winding energized by alternating-current power source, comprising:

a casing,

a positive characteristic thermistor connected in series to the auxiliary winding,

an auxiliary positive characteristic thermistor connected parallel to the positive characteristic thermistor and the snap action bimetal,

a slow action bimetal connected in series to a series circuit of auxiliary winding and positive characteristic thermistor for sensing the heat from the auxiliary positive characteristic thermistor and turning off when reaching a set temperature, and

an enclosed compartment accommodated in the casing, for enclosing the slow action bimetal and auxiliary

positive characteristic thermistor.

In the starter of single-phase induction motor as set forth in ~~claim~~ embodiment 19, when starting up the single-phase induction motor, the positive characteristic thermistor is low in resistance, and a starting current flows through the auxiliary winding by way of series circuit of positive characteristic thermistor and slow action bimetal, and the single-phase induction motor is started up. When the starting current flows, the positive characteristic thermistor generates heat by itself, and becomes high in resistance, and more current flows into the auxiliary positive characteristic thermistor side connected parallel to the positive characteristic thermistor. When the auxiliary positive characteristic thermistor reaches a set temperature, the slow action bimetal is cut off, and no current flows into the positive characteristic thermistor, and the single-phase induction motor is started up completely and gets into stationary operation.

When the slow action bimetal is cut off, current flows only into the auxiliary positive characteristic thermistor side to generate heat, and by this heat generation, the slow action bimetal is kept in OFF state.

Therefore, during stationary operation of single-phase induction motor, no current flows into the positive characteristic thermistor and instead current flows into the auxiliary positive characteristic thermistor side, but the current flowing in the auxiliary positive characteristic thermistor is very small only enough to generate heat in the auxiliary positive characteristic thermistor for holding the OFF state of the slow action bimetal, and power consumption by the auxiliary positive characteristic thermistor is extremely smaller than the power consumption by the conventional positive characteristic thermistor.

In particular, since the slow action bimetal and auxiliary positive characteristic thermistor are contained in a same enclosed compartment in the casing, heat hardly radiates outside, and the OFF state of the slow action bimetal can be maintained by a very small power consumption. Further, as the refrigerant of enclosed compressor, flammable gas (hydrocarbon compound such as butane) is used, and if the refrigerant leaks, it is contained within the enclosed compartment, ignition by spark in opening and closing action of slow action bimetal

is prevented.

Further, since slow action bimetal is used, as compared with the formed snap action bimetal, it withstands use for a longer period of time.

Further, during stationary operation of single-phase induction motor, the positive characteristic thermistor for starting in large thermal capacity is cooled, and temperature is ordinary. On the other hand, since the auxiliary positive characteristic thermistor is small in thermal capacity, it is quick to cool. Therefore, when attempted to start up again right after stopping the single-phase induction motor, the auxiliary positive characteristic thermistor is immediately cooled nearly to ordinary temperature, and it is ready to start up very quickly in several seconds to dozens of seconds, and it is possible to re-start quickly without repetition of operation and reset of overload relay as in the prior art.

In ~~claim~~ embodiment 20, an auxiliary positive characteristic thermistor contacts with the base of the slow action bimetal. Hence, the heat from the auxiliary positive characteristic thermistor can be efficiently

transmitted to the slow action bimetal, and the OFF state of the slow action bimetal can be maintained by the auxiliary positive characteristic thermistor of small power consumption.

In order to achieve the above objects, according to ~~claim~~ embodiment 21, a starter of single-phase induction motor having main winding and auxiliary winding energized by alternating-current power source, comprising:

a positive characteristic thermistor connected in series to the auxiliary winding,

an auxiliary positive characteristic thermistor connected parallel to the positive characteristic thermistor and the snap action bimetal,

a slow action bimetal connected in series to a series circuit of auxiliary winding and positive characteristic thermistor for sensing the heat from the auxiliary positive characteristic thermistor and turning off when reaching a set temperature, and

a snap action bimetal connected in series to a series circuit of auxiliary winding, positive characteristic thermistor, and slow action bimetal for sensing the heat from the positive characteristic thermistor and turning off

when reaching a specified high temperature.

In the starter of single-phase induction motor as set forth in ~~claim~~ embodiment 21, when starting up the single-phase induction motor, the positive characteristic thermistor is low in resistance, and a starting current flows through the auxiliary winding by way of series circuit of positive characteristic thermistor and slow action bimetal, and the single-phase induction motor is started up. When the starting current flows, the positive characteristic thermistor generates heat by itself, and becomes high in resistance, and more current flows into the auxiliary positive characteristic thermistor side connected parallel to the positive characteristic thermistor. When the auxiliary positive characteristic thermistor reaches a set temperature, the slow action bimetal is cut off, and no current flows into the positive characteristic thermistor, and the single-phase induction motor completes starting-up and gets into stationary operation.

When the slow action bimetal is cut off, current flows only into the auxiliary positive characteristic thermistor side to generate heat, and by this heat generation, the slow action bimetal is kept in OFF state.

Therefore, during stationary operation of single-phase induction motor, no current flows into the positive characteristic thermistor and instead current flows into the auxiliary positive characteristic thermistor side, but the current flowing in the auxiliary positive characteristic thermistor is very small only enough to generate heat in the auxiliary positive characteristic thermistor for holding the OFF state of the slow action bimetal, and power consumption by the auxiliary positive characteristic thermistor is extremely smaller than the power consumption by the conventional positive characteristic thermistor. Further, since slow action bimetal is used, as compared with the formed snap action bimetal, it withstands use for a longer period of time.

When the positive characteristic thermistor generates heat abnormally and reaches given high temperature, the snap action bimetal is cut off, and current to the auxiliary winding is cut off, thereby preventing the positive characteristic thermistor from running away thermally, to be high in temperature and low in resistance, and breading down insulation by flow of excessive current through the auxiliary winding.

In ~~claim~~ embodiment 22, the snap action bimetal is set so that it may not reset at ordinary temperature. Hence, thermal runaway of positive characteristic thermistor by reset by snap action bimetal can be prevented completely.

In ~~claim~~ embodiment 23, the starter of single-phase induction motor, wherein the contact point of the slow action bimetal and contact point of the snap action bimetal directly contact with each other,

when the slow action bimetal reaches the set temperature, it is departed from the contact point at the snap action bimetal side, and

when the snap action bimetal reaches the specified high temperature, it is departed from the slow action bimetal side. When the slow action bimetal is cut off by application of heat, heat is also applied to the snap action bimetal side, and it is slightly moved to the side departing from the slow action bimetal side, and by using a slow action bimetal slow in action though long in life, the starting current can be cut off appropriately. That is, along with temperature rise, both bimetals move in mutually departing direction, and chattering hardly occurs. Further, since both contacts are made of movable contacts, wiping

(rubbing) phenomenon always occurs by temperature changes, the contact contacting portions are cleaned, and a long life is realized by using silver contact without gold plating. Further, since the contact points of slow action bimetal and contact points of snap action bimetal directly contact with each other, lower cost and lower resistance are realized as compared with the case of interposing terminal members of metal plates or the like providing fixed contacts at both sides.

In ~~claim~~ embodiment 24, a stopper is provided to contact with the leading end of the snap action bimetal, so as not to disturb the operation of the slow action bimetal. It is hence possible to prevent warping to the slow action bimetal side if the snap action bimetal returns to ordinary temperature due to cooling of positive characteristic thermistor after completion of starting."